

ENVIRONMENTAL OFFSET PLAN FOR GRANTHAM LANE ASSOCIATES, LLC PROPOSED AGGREGATE CRUSHER FACILITY

Executive Summary

The proposed Environmental Offset Plan supports Grantham Lane Associates, LLC's ("Grantham Lane Associates") Coastal Zone Application for a proposed aggregate crushing operation consisting of an diesel powered crusher to reduce the size of the materials to be processed.

The proposed Offset Plan involves several components:

- a. Obtaining two tons of emissions credits from Delaware Economic Development Office (DEDO).
- b. Planting of 200 native trees on site.
- c. Conversion of heating system at an existing Grantham Lane Associates building (from fuel oil to propane).
- d. A one-time financial contribution of \$2,500.00 to assist in the conversion of a hot water heating system at a local school (from fuel oil to natural gas).
- e. Removing a solid waste stream from Delaware's solid waste management system.
- f. Extending the life of Delaware's landfills thereby deferring the environmental impacts of construction and operation of newly permitted landfill space.

The table below lists the emissions from the proposed operations and the proposed emissions offsets.

Contaminant	Emissions in Tons Per Year			
	Aggregate crusher actual emissions	Target Emission Offsets Required (130% of Actual)	Proposed Emission Offsets (Reductions)	
PM	0.10	0.13	(0.130)	
CO	0.20	0.26	(0.260)	
NOx	1.07	1.391	(1.524)	
SOx	0.07	0.091	(0.161)	
HC	0.06	0.078	(0.078)	
Total	1.50	1.95	(2.1573)	

The applicant wishes to inform the Department that the approval of the Coastal Zone Permit will result in a reduction in air emissions due to the reduction in truck trips to obtain construction aggregates for future construction projects. While not officially a component of the Offset Plan, the reduction in truck trips both within the Coastal Zone and on highways within the State of Delaware will result in a safer and cleaner Delaware for state residents in addition to recycling needed construction materials which are not readily available site-wide.

1.0 INTRODUCTION

The following Environmental Offset Plan was prepared by Compliance Plus Services, Inc. ("CPS") in support of the Grantham Lane Associates, LLC's ("Grantham Lane Associates") Coastal Zone Application for a proposed aggregate crushing operation. The proposed operations consist of the operation of one diesel powered aggregate crusher to reduce the size of the material processed. Detailed description of the aggregate crusher operations is provided in the Coastal Zone Application. This Plan describes the proposed environmental benefits Grantham Lane Associates has identified or demonstrated in support of the application to offset the potential environmental impacts of the aggregate crusher facility.

The aggregate crushing operation will provide a number of environmental benefits. These will include, but are not limited to:

- Removing a waste stream from Delaware's solid waste management system to both reduce the volume of solid waste disposed of in the state and produce a material that can be beneficially used and returned to the marketplace;
- Preserving Delaware's natural resources through the reuse of recycled aggregate material processed with the aggregate crusher instead of raw materials in projects across the state;
- Reducing various air emissions and other environmental contaminants related to the extraction of raw materials;
- Development of the existing site to provide for the collection and management of stormwater runoff from the site.

Currently, this material (broken concrete, asphalt, brick, block, etc.) is often disposed of at landfills within the State of Delaware. Despite a widespread recycling program in Delaware, over 23% of the construction and demolition (C&D) waste is still landfilled (Reference: Delaware Solid Waste Authority Statewide Waste Characterization Study 2006-2007 Final Report October 31, 2007). In the period June 2006 through May 2007, over 265,000 tons of C&D waste was disposed. Any reduction in the amount of solid waste being landfilled benefits all of the citizens of Delaware by extending the life of the current landfills for those wastes which cannot be readily recycled or reused.

The processing of the broken concrete and asphalt at the proposed facility will result in an increase in air emissions from the crusher equipment used to size the concrete and asphalt into materials suitable for use in new construction projects. The air emissions will be in the form of particulate matter (PM). This information is detailed in Section 5 of the Coastal Zone application and is further discussed below. Coastal zone permit regulations require the applicant to provide offsets which clearly and demonstrably are more beneficial to the environment, particularly in the Coastal Zone, than the potential environmental impacts associated with the proposed activities that require permitting.

This proposed Environmental Offset Plan includes offsets in the reduction of direct and indirect media pollutants, positive enhancement of and replenishment of natural resources that will provide an overall benefit to the Coastal Zone region.

2.0 FACILITY INFORMATION

2.1 Current Site Conditions

The current site is located on Grantham Lane, New Castle, DE. The facility is situated on a 30.8 acre site which is being developed as an industrial park by Grantham Lane Associates, LLC. Currently certain infrastructural improvements have been completed including the entrance road, parking areas, stormwater management structures (wet pond and recharge basin) and site utilities. Other buildings are being planned as shown on the Record Major Land Development Plan of Grantham Lane Industrial Park prepared by McBride & Ziegler, Inc. (See Exhibit A).

2.2 Proposed Site Improvements

Grantham Lane Associates, LLC proposes to install the aggregate crusher at its current location on Grantham Lane, New Castle, DE. The proposed location is shown on the site plan provided as Exhibit B.

The Coastal Zone Act Permit Application includes aggregate crusher operations of 1000 hours per year. The emissions calculations are based on processing 100,000 tons of aggregates per year.

3.0 OFFSET PLAN

The proposed Offset Plan consists of several components:

- a. Obtaining two tons of emission credits (NOx) from the Delaware Economic Development Office (DEDO).
- b. A one-time financial contribution of \$2,500.00 to assist in conversion of a hot water heating system at a local school (from fuel oil to natural gas).
- c. Planting of native trees on site.
- d. Conversion of heating system at an existing Grantham Lane Associates building (from fuel oil to propane).

The emissions detailed in this Plan have been generated based upon a variety of sources:

- a. Emission factors detailed in U.S. Environmental Protection Agency's (USEPA) AP-42.
- b. Engine specific data provided by the engine manufacturer.

- c. U.S. Department of Energy, April 1998. Method for Calculating Carbon Sequestration by Trees in Urban or Suburban Settings. Voluntary Reporting of Greenhouse Gases Program, U.S. Department of Energy, Washington, DC.
- d. Air Pollution Removal Calculator, Version 1.0. U.S. Department of Agriculture, Forest Service, Urban Forest Effects Model.

The major component of the Offset Plan consists of the two tons of NO_x emissions credits which will be obtained from DEDO. The removal of two tons of NO_x from the Coastal Zone provides significant benefits to the residents of Delaware and will promote overall improvements to the environment.

NO_x causes a wide variety of health and environmental impacts because of various compounds and derivatives in the family of nitrogen oxides, including nitrogen dioxide, nitric acid, nitrous oxide, nitrates, and nitric oxide. The U.S. Environmental Protection Agency (EPA) identifies nitrogen oxide emissions as an environmental and health concern for a number of reasons. Among EPS's chief concerns are that these emissions:

- Are a major contributor to the formation of ground level ozone (smog);
- Lead to production of acid rain which causes environmental damage to lakes and streams and property damage to cars and buildings;
- Create small particles in the air that can cause lung infection or respiratory concerns;
- Cause increased nitrogen loading in water bodies, particularly coastal estuaries; and
- Are among the greenhouse gases that are a concern due to potential global climate changes.

Reducing NO_x emissions is considered particularly beneficial since their impact is wide ranging and affects citizens of all ages throughout the state.

3.1 Obtaining Emission Credits from Delaware Economic Development Office (DEDO)

Grantham Lane Associates proposes to obtain emission credits through the Delaware Economic Development Office (DEDO). An acquisition of two tons of NO_x emissions credits will be completed concurrent with the issuance of the Coastal Zone permit.

3.2 Replacement of a Hot Water Heating System from Fuel Oil to Natural Gas

Grantham Lane Associates proposes to provide a one-time financial contribution to a local school (St. Peter's) to assist in the replacement of an ancient hot water heating system from fuel oil to natural gas. The current hot water heating system uses an 'Esso' burner rated at 3.75

gallons/hour to heat hot water for the school year round. The unit has been in place for approximately 50 years according to school officials. The unit uses fuel oil from a central oil storage tank (which also provides fuel to a central heating plant). The total fuel oil use is approximately 4000 gallons per year. The school purchases oil once a year; monthly consumption records are not available. Discussions between Mike Cirillo, his plumber and school officials estimate that the hot water heater system utilizes approximately 800 gallons of fuel oil per year. This estimate is likely to be conservative due to the age of the hot water heating system burner and its year round operation.

Natural gas has been shown to be a cleaner burning fuel, as the emissions during the combustion process are lower than the emissions produced by the combustion of fuel oil currently being used.

The financial contribution will cover approximately 20% of the project cost. The remainder of the project cost will be funded from other sources.

Grantham Lane Associates is proposing that one-half of the reduced emissions be included in the subject Off-Set Plan. This percentage is considered fair and reasonable since Grantham Lane Associates' financial contribution will cover approximately 20% of the project cost.

See Exhibit C for detailed calculations.

Detailed Emission Calculations for School Water Heater			
Pollutant	Esso Water Heater No. 2 Fuel Oil (old unit)¹	Bradford White Water Heater Natural Gas (New Unit)¹	Difference²
	<i>Tons/year</i>	<i>Tons/year</i>	<i>Tons/year</i>
PM	6.50E-04	1.69E-04	4.81E-04
CO	2.50E-03	1.18E-03	1.32E-03
NOx	0.01	2.78E-03	6.22E-03
SOx	0.02	1.78E-05	2.13E-02
HC	3.50E-04	1.63E-04	1.87E-04
Total (Tons)	0.03	4.32E-03	2.95E-02

3.3 Replacement/Installation Existing Heating System

Grantham Lane Associates proposes to replace the existing heating system at one of the buildings at the company's facility. This conversion will remove the fuel oil heating system currently used, replacing it with heating units fueled by propane.

The current building currently maintains two (2) heating systems, both of which are Modine fuel oil burners (Model POR145B0101). For the purposes of this Offset Plan, it was assumed that, in a normal year, these units are operational from October – April. During this heating season, it

was estimated that the heating units run for 70% of the time. As such, it is estimated that each unit provides heat for approximately 3,560 hours per year.

The total hours of operation identified above was used to estimate the emissions from the proposed propane heating systems. Grantham Lane Associates proposes to install Reznor propane burners (Model UDAP 150), replacing the existing fuel oil units.

As is the case with natural gas, propane has been shown to be a cleaner burning fuel than the fuel oil currently being used.

See Exhibit C for detailed calculations.

Difference in Emissions - Grantham Lane Associates			
Pollutant	Modine - No. 2 Fuel Oil (old units)	Reznor - Propane (New Units)	Difference in Emissions
	<i>Tons/year</i>	<i>Tons/year</i>	<i>Tons/year</i>
PM	4.80E-03	2.98E-03	0.0018
CO	1.84E-02	1.87E-02	-0.0002
NOx	6.64E-02	7.59E-02	-0.0095
SOx	1.57E-01	5.84E-04	0.1566
HC	2.58E-03	2.92E-03	-0.0003
Total (Tons)	0.25	0.90	0.151

3.4 Planting of Native Species Trees at the Site

Grantham Lane Associates proposes to plant native trees at the company's facility, 200 of which will be Eastern Red Cedar (*Juniperus virginiana*) trees. This proposal is further detailed in the Landscaping Plan, prepared specifically to address the tree planting scenario and included as Exhibit F.

Initially, the Eastern Red Cedar trees will be between 4-5 feet in height. Eastern red cedar trees grow at a medium growth rate and, at maturity, can be 40 -50 feet tall. At full maturity, the trees have a spread of 8 – 20 feet. See Exhibit D.

The new tree cover at the facility will provide numerous benefits, many of which are difficult to quantify. Among the benefits are:

- Creating a windbreak to reduce the transport of PM off-site. Trees placed in a tree line can reduce windspeed by up to 85%⁽¹⁾;
- Creating a "noisebreak" by reducing the transport of noises associated with the proposed project across property lines;
- Increasing the absorption of water during periods of rain, thus decreasing the flow of stormwater at the facility and providing cleaner water. It has been estimated that 100

mature trees can intercept up to 100,000 gallons of rainfall per year.⁽²⁾ In addition, trees can reduce runoff by up to 7%⁽³⁾;

- d. Lower water loss by reducing evaporative emissions;
- e. Carbon Sequestration – Trees naturally can capture and hold atmospheric carbon, particularly carbon dioxide.
- f. Improving the general aesthetic appeal of the facility, not only within the facility, but also to the surrounding area. This appeal can potentially increase the property values of the surrounding property;
- g. Emission reduction from reducing the areas that need mowing.

Particularly applicable to the Proposed Offset Plan, the Eastern red cedar trees, planted in a tree line adjacent to the proposed location of the aggregate crusher, will have the ability to reduce the transport of particulate matter off-site.

The prevailing wind direction at the site is from the northwest⁽⁴⁾. The tree line will be located southeast of the proposed location of the crusher. Using the USEPA AP-42 Screen3 model, it is estimated that the trees will reduce PM emissions from leaving the property by 0.003 tons/year. The estimate is calculated assuming that a plume width at the tree line of approximately 70 meters, a contaminant reduction of 40% at the tree line and the winds from the northwest occur 30% of the year. Details of the calculations are provided in Exhibit C.

References

- (1) Heisler, Gordon M. 1990. Tree plantings that save energy. In: Rodbell, Philip D., ed. Proceedings of the Fourth Urban Forestry Conference; 1989 October 15-19; St. Louis, MO. Washington, DC: American Forestry Association.
- (2) USDA Forest Service. 2003. Benefits of Urban Trees. Urban and Community Forestry: Improving Our Quality of Life. Forestry Report R8-FR 71. [Atlanta, GA:] Southern Region.
- (3) Miller, Alban L.; Riley, J.; Schwaab, E.; Rabaglia, R.; Miller, K. 1995. Maryland's Forests: A Health Report. Annapolis: Maryland Department of Natural Resources Forest Service.
- (4) US Department of Agriculture Natural Resources Conservation Service, Wind Rose Plots for Wilmington, DE (copy provided in Exhibit E)

3.5 Emissions Summary

Delaware's Coastal Zone Permit regulations require that the offset proposal must clearly and demonstrably more than offset any new pollution from the proposed operations. Informal guidance indicates that the offset proposal must be at least 30% greater than the estimated level of new emissions. The following table provides details on the emission estimates from the proposed crusher facility; the second column shows the levels at 30% above the emissions estimate.

Contaminant	Emissions in Tons Per Year	
	Aggregate crusher Actual Emissions	Target Emission Offsets (130% of actual)
PM	0.10	0.13
CO	0.20	0.26
NO_x	1.07	1.391
SO_x	0.07	0.091
HC	0.06	0.078
Totals	1.50	1.95

3.6 Discussion of Specific Contaminants

3.6.1 Particulate Matter (PM):

The proposed aggregate crusher is estimated to produce particulate matter emissions of 0.10 tons/year. Of this amount, 0.06 tons/year is estimated to be PM₁₀, which consists of particles that are 10 micrometers in diameter or smaller. Particles in this size range are considered to be respirable dust by OSHA and the EPA, and may have adverse health effects of the heart and lungs. The proposed offsets including the replacement of the heating units, the school water heater replacement project and the planting of trees are expected to reduce the emissions of PM by 0.0049 tons/year. Additionally, 0.13 tons per year of the NO_x emission credits are proposed to be allocated to offset the PM emissions. This will result in a total offset of 0.135 tons/year.

The use of the NO_x credits, proposed above, more than offsets PM emissions associated with this operation. NO_x emissions, as stated in 3.0 above, cause similar effects in the environment as PM emissions due to their ability to combine with other compounds to form small particles that lead to respiratory concerns (similar to the PM₁₀ component of the emissions described here). NO_x emissions contribute to ground level ozone and visual pollution (again similar to visibility impairments caused by PM). However, NO_x emissions also contribute to a wide range of additional negative environmental and health impacts that more than offset the effect associated with the proposed PM emissions.

3.6.2 Carbon Monoxide (CO):

The proposed aggregate crusher is estimated to produce CO emissions of 0.20 tons/year. The replacement of the heating units and the school water heater replacement project will result in a small decrease in CO emissions. Additionally, 0.26 tons per year of the NO_x emission credits are proposed to be allocated to offset the PM emissions. This will result in a total offset of 0.26 tons/year.

Carbon monoxide can cause harmful health effects by reducing oxygen delivery to the body's organs with adverse effects on those suffering from heart disease. It also contributes to the formation of ground level ozone which can trigger serious respiratory

problems. Carbon monoxide also has important indirect effects on the potential for global climate change. Carbon monoxide reacts with hydroxyl radicals in the atmosphere, reducing their abundance and limiting their usefulness in reducing the lifetimes of strong greenhouse gases.

The use of NOx credits, proposed above, more than offsets the CO emissions associated with this operation. NOx emissions, as stated in 3.0 above, cause similar effects in the environment as CO emissions due to their ability to combine with other compounds to form small particles that lead to respiratory concerns (similar to the CO component of the emissions described here). NOx emissions contribute to ground level ozone (again similar to contribution caused by CO). One member of the NOx, N₂O, is a greenhouse gas. It has been assigned a 20 year Global Warming Potential value 280 times the value of carbon dioxide by the Intergovernmental Panel on Climate Change (1996). Thus the reduction in NOx emissions will more than offset the CO emissions.

3.6.3 Nitrogen Oxides (NOx):

The proposed aggregate crusher operations is estimated to produce 1.07 tons/year of NOx emissions. The replacement of the heating units and the school water heater replacement project will result in a negligible increase in NOx emissions. NOx emissions credits from DEDO totaling 1.532 tons/year will provide a total offset of 1.524 tons/year.

3.6.4 SOx:

The proposed aggregate crusher operations is estimated to produce SOx emissions of 0.07 tons/year. The proposed offsets including the replacement of the heating units and the school water heater replacement project are expected to reduce emissions of SOx by 0.161 tons/year.

3.6.5 Hydrocarbons (HC):

The proposed aggregate crusher operations is estimated to produce HC emissions of 0.06 tons/year. The replacement of the heating units and the school water heater replacement project will result in a very slight increase in HC emissions. It is proposed to allocate 0.078 tons per year of the NOx emission credits to offset the HC emissions.

The use of NOx credits, proposed above, more than offsets the HC emissions associated with this operation. NOx emissions, as stated in 3.0 above, cause similar effects in the environment as HC emissions since each contributes to the formation of ground level ozone. Reducing the amount of NOx emissions will reduce the potential for ground level ozone, just as reducing the amount of HC emissions would.

3.7 Comparison of Emissions from Proposed Facility to Offset Plan

The table below is a comparison of the proposed emissions from the crusher facility offset by proposed emissions from the crusher facility offset by the emissions from the various

components of the Offset Plan. The proposed offsets total 2.16 tons/year which is greater than the informal goal of 2.12 tons/year.

Contaminant	Propane Heating Unit Installation (2 Units)	School Water Heater Replacement (Note 2)	Tree Planting	Offset Credits (DEDO)	Offset Totals (tons/yr)	Proposed Crusher Operations (tons/yr)	Proposed Operations @ 1.3 x's (tons/yr)
PM	0.00180	9.62E-05	0.003	0.130 (NOx)	0.135	0.1	0.130
CO	-0.00020	2.63E-04	0.000	0.260 (NOx)	0.260	0.2	0.260
NOx	-0.00950	0.00124	0.000	1.532	1.524	1.07	1.391
SOx	0.15660	0.0043	0.000	0.000	0.161	0.07	0.091
HC	-0.00030	3.74E-05	0.000	0.078 (NOx)	0.078	0.06	0.078
Total	0.14840	0.006	0.0030	2.000	2.1573	1.500	1.950

- 1). Emissions based on estimated emissions from proposed crusher installation at Grantham Lane facility.
- 2). Emissions offsets from the water heater replacement project are 20% of estimated emissions (since 20% of the project will be funded by Grantham Lane Associates)

4.0 SOCIO-ECONOMIC IMPACTS

The aggregate processing operation proposed by Grantham Lane Associates has several socio-economic benefits to the surrounding area. These benefits include, but are not limited to, the following:

- a. Reduction in the amount of materials taken to landfills, thus creating more space for the disposal of other materials and potentially extending the life of the landfills.
- b. Aesthetically improving the site by planting trees at the Grantham Lane Associates' facility, which is located in an industrialized area.
- c. Contributing to the health and education of the youth of the area by assisting in the St. Peters school, in a hot water heating system replacement, reducing the operating cost for the school.

5.0 NATURAL RESOURCES CONSERVATION

The proposed facility is, by the very nature of its operations, dedicated to improving the environment within the Coastal Zone. As demonstrated above, the proposed facility will transfer the delivery of waste aggregate materials from the landfills to the Grantham Lane Associates' facility, where it will be processed. This process of recycling a former waste stream into a useable product will provide continuing benefits to the environment throughout the State.

The proposed waste aggregate materials currently would eventually be disposed of in landfills, thus taking up much needed space. Through the proposed recycling process, this material will

instead be processed at the Grantham Lane Associates' facility and reused in their projects, thus eliminating the landfill from the process entirely. In addition, the raw materials formerly used in Grantham Lane Associates' projects will now be eliminated through the reuse of the recycled products.

Grantham Lane Associates' proposal also includes new planting of native landscaping trees at the property. This will result in increased aesthetics and improve the integration of the environmental setting of the Coastal Zone area.

6.0 OTHER FACTORS FOR CONSIDERATION

6.1 Reduction in Truck Trips for Future Construction Projects

Grantham Lane Associates' on-going construction projects require various types of aggregates for the foundations, or base course, of site improvement projects. These projects include sidewalks, curbing, roadways and driveways. Currently, Grantham Lane Associates obtains these materials from quarries or other supply points located a significant distance from Grantham Lane Associates' yard (which is co-located at the site of the proposed aggregate crusher).

The proposed aggregate crusher would produce these materials on site, allowing Grantham Lane Associates to recycle concrete and asphalt from demolition portions of projects. This resulting change will be twofold: first, the shorter travel time and distance will reduce the emissions produced by the operation of the truck engines. The truck emissions include the following air contaminants: Nitrogen Oxides (NOx), Carbon Monoxide (CO), Particulate Matter (PM), Sulfur Oxides (SOx), and Volatile Organic Contaminants (VOCs), aka Hydrocarbons (HC).

Additionally, the travel along roadways causes a gradual deterioration of both the roadways and vehicle tires. Through the reduction of travel distance and time, Grantham Lane Associates will reduce the emissions of particulate matter generated through this process. While the Department cannot consider these factors as part of the official Offset Proposal, these reductions are real and will result in improvements in the quality of life within the State of Delaware.

Transport to Quarry (Tons/Year)

PM Emissions ¹	PM 10 Emissions ³	PM 2.5 Emissions ³	CO Emissions ²	NOx Emissions ²	HC Emissions ²	SOx Emissions ²
53.38	10.40	1.59	4.48	4.06	0.38	0.27

Transport to Grantham Lane Associates' Site (Tons/Year)

PM Emissions ¹	PM 10 Emissions ³	PM 2.5 Emissions ³	CO Emissions ²	NOx Emissions ²	HC Emissions ²	SOx Emissions ²
24.54	4.78	0.72	1.88	1.71	0.16	0.11

Difference

PM Emissions ¹	PM 10 Emissions ³	PM 2.5 Emissions ³	CO Emissions ²	NOx Emissions ²	HC Emissions ²	SOx Emissions ²
28.84	5.62	0.87	2.60	2.35	0.22	0.16

Notes:

- 1). Estimates based upon roadway emissions and engine emissions.
- 2). Estimates based upon engine emissions.
- 3). Estimates based upon roadway emissions

See Exhibit G for detailed emission calculations for deferred truck trips.

6.2 Carbon Sequestration by the Proposed Trees

As discussed in Section 3.3, Grantham Lane Associates proposed to plant a total of 200 Eastern red cedar trees. The addition of the trees at the Grantham Lane Associates' facility will capture carbon and CO₂, thus removing potential greenhouse gases from the atmosphere. These numbers are not included in the offset as neither carbon nor CO₂ were calculated for the proposed crusher operations.

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